E/CONF.39/B/18
10 Oct.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: B.3

Netherlands

MANAGEMENT EDUCATION THROUGH ASSIGNMENTS IN INDUSTRY

By Ph.B. van HARREVELD, M.Sc. Eng.
Staffmember, Research Institute for Management Science
Delft (Netherlands)

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

4. Papers and summaries will not be available for general distribution in advance of the Conference. They will be published in advance in limited quantities only for the use of delegations of participating governments and of other authorized participants. Post-Conference publication and general distribution of the Conference Proceedings will follow United Nations practices as laid down by the United Nations Publications Board.

MANAGEMENT EDUCATION THROUGH ASSIGNMENTS IN INDUSTRY

by
Ph.B. van Harreveld, M.Sc. Eng.
Staffmember, Research Institute for Management Science, Delft (Netherlands)

MANAGEMENT EDUCATION: Principles and integrated application.

1. Management science stands midway between the natural sciences, where experiments and laboratory work are of prime importance in imparting knowledge, and national economics and sociology where controlled experiments are hardly possible. The laboratory of management science is industry itself and it is of great importance to find ways and means to train students of management science in industry without endangering the normal functioning of the enterprise.

2. The enterprise as a whole is a complex field of study; management science divides the field of management into a number of sectors such as production, marketing, personnel management, costing and financing. Each sector comprises many fields of study, for instance in the sector production problems of lay-out and routing, planning, lot-size, etc. In general for each of these elementary fields of study a theoretical solution can be found if the ceteris paribus condition is applied. The theory of management science gives a number of guiding principles for each element of the enterprise.

3. However, analysing and improving the situation and structure in an existing enterprise is a completely different proposition. Here the student would have to start by measuring or recording the existing situation element by element, for instance the element lay-out. In other words he will make an abstract model highlighting only that particular element like a lay-out sketch with routing. Then he will measure in how far the existing situation differs from the guiding principle.

4. Having done this for all elements separately he will try to find an integrated solution for the enterprise as a whole. This solution will also have to take into account the market expectations and future policy of the firm; it may also be necessary to estimate funds available for improvements as well as the returns to be expected therefrom. Of course in an actual situation he will not have to analyse all elements thoroughly at the same time as some of them may prove to be obvious. He will then select one or more important improvements which are considered feasible and profitable. In most cases it will be possible to arrive at a reasonable solution by simply assigning weight to the other factors and keeping them in mind while solving the element in question.

5. This integration process, proceeding from improvement of elements to an integrated plan in which financial consequences, future expectations and business policy are properly accounted for, is a very difficult one and requires experience, ingenuity as well as an insight in the interdependence of the element problems and furthermore a common denominator.

6. Last but not least a practitioner must be able to "sell" his solution to management. Some managers will be more interested in production, others in marketing or financing. The practitioner must therefore assess the "climate" of the enterprise and present his solutions accordingly.

7. The guiding principles of management science can easily be taught in

class by means of lectures and exercises. It is more difficult, however, to teach the process of integration. In future operations research and business games may be the means to deal with important facets of the integration process in class.

8. At present case-studies, such as used by the Graduate School of Business of the Harvard University, provide the possibility of simulating this integration process. Such a case-study gives an elaborate description of a particular firm as a total and its different aspects. This description forms the basis for a class discussion evaluating the existing situation ("would you invest in this firm?") and formulating suggestions for improvement. During the discussion the discussion leader can add a touch of reality by formulating assumptions pertaining to cost and impact of improvements and by doing so highlight the process of integration of all aspects in an optimal solution.

9. Actual study in industry, however, provides the student with a realistic opportunity for the translation of guiding principles into practical dynamic action. Instead of reading a more or less abstracted systematic description he is faced with the baffling day-to-day complexity of a real situation. He must first record, than analyse and by careful weighing come to a balanced solution. Then the manager has to approve the proposals and finally the student has to assist with implementation and to evaluate the results.

10. All the time he has to work full time in the enterprise and after one or a few of such experiences, preferably in different firms, he will have gained a deep insight into the actual operation of an industrial enterprise.

ASSIGNMENTS IN SMALL INDUSTRIES: Project Set-up

11. Small industry offers very good possibilities for a student executing an in-plant assignment; the student is able to oversee in a limited time all activities in the plant and get "the feel of it".
His analysis of the existing situation will take into account all the sectors of the enterprise and so he can more easily arrive at an optimum solution which is in line with the overall policy of the firm.

12. In general, however, the small enterprise will not have a man available to guide the work of the student; its staff of the small firm is as a rule overburdened and has not the training and background necessary to give the student the necessary guidance. The student will therefore have to be coached by an outside supervisor who will be able to supervise a limited number of students simultaneously.

13. As the student will have to work rather independently and cannot fall back on staff departments, he must be made acquainted beforehand with the necessary tools, viz. the recording techniques by means of an applied course.

14. Supervision and coaching as well as the applied course in recording techniques make it imperative to execute in-plant work in small industries on a project basis.

15. Since 1953 the Research Institute for Management Science (RVB), Delft (Netherlands), has executed several of such projects for various groups of students (both Dutch and foreign).
The following remarks are based on 9 years of experience during which approximately 380 students participated in such projects.

CARRYING OUT A TYPICAL PROJECT

16. The first programme of in-plant work in small industry executed by RVB was held in the fall of 1953. The participants were advanced students of the Technological University in Delft in their last year before obtaining a Master Degree. Although later on several projects were executed for different groups of trainees, these other projects represent only minor variations on a theme which had proved successful and will be dealt with later (vide 37-43).

17. Some of the main characteristics of this first project will be described in the following.

Structure of the programme

18. The students were given a four weeks course followed by assignments in small enterprises. Ten students participated in this project and were placed in ten industrial enterprises such as a biscuit factory, a cask factory, a factory producing metal furniture etc.

Selection of the participants

19. A first requirement for participation is that the student is interested in working in a small or medium-sized firm; secondly, he must be able to work rather independently and thirdly he must be able to adapt himself to the various circumstances and to establish and maintain pleasant contacts on the different levels. As the emphasis is on down-to-earth practical improvements involving only limited expenditure, this kind of work is certainly not suited for the more scientifically orientated student.

20. The selection was based on recommendations of the student's professor or supervisor and a personal interview; in some cases simple psychological tests were used.

Applied introductory course

21. The introductory course has to be an applied one in the most literal meaning of the word. If the students have already studied the principles of scientific management within the framework of their regular studies, only a very short refresher is required.

22. A major part of the time available is then devoted to the analysis of the production process and work methods study. Practical experience has to be introduced into class by means of case-studies. Furthermore short practical team studies in a plant are included in the programme, such as a three days work study project.

23. Of course the objective of such a course can never be to make the student a time study analyst but to give him sufficient working knowledge of the techniques in order to be able to analyse the production process in terms of time utilization, operation times, work methods, lay-out, etc.

24. As much as possible students should be brought together from time to time to discuss case-studies made of practical problems encountered during their experience. These problems can be taken from every type of industry as they have to illustrate more an approach to the problem than a solution of a particular problem.

Individual assignments in industries

25. The firm participating in the project has to be selected by the project supervisor, soliciting the co-operation of the management; in general he will have to guarantee that the study will be treated confidentially. Then he has to decide in consultation with the manager what kind of assignment should be carried out by the student, after having visited the firm and having surveyed the plant in a general way. Also the co-operation of lower echelons of management should be ensured. Care should be taken that the workers are informed about the nature of the activities of the student in the firm.

26. Before being introduced in the firm by the supervisor, the participant is given a written assignment specifying the general direction of the study and the necessary recordings that have to be made first.

27. The assignment will include basic data about the firm and its management, the name of the coach and a rough time schedule for the work to be performed including the report and date of submission of the draft.

28. Whenever possible a staffmember of the firm is assigned as liaison-officer.
29. The assignment comprised making an analysis of the process and finding eventual bottle-necks or the operations where the highest amount of value was added.
He then had to try to improve these operations and if necessary also other operations in order to streamline production.
30. Out of the 13 weeks of the total assignment approximately six weeks were reserved for analysis and the development of proposals for improvement. Then an interim report had to be presented to the management, while the balance of the period was reserved for assisting management in the implementation of the suggested improvements.
31. At the end of the period the student had to present a final report evaluating the proposals and the improvements actually realized.
32. Great emphasis was placed on acquainting the student with the problem of presenting his plans for improvements to management, overcoming eventual resistance during implementation.
33. During the in-plant studies each student was visited once a week on the average by the coach who reviewed the progress of the work and gave suggestions for further action. It was preferred to visit the plant because of personal contacts with the firm's management.

Contact with management

34. During the in-plant period it is advisable to inform the management about the type of work the students are doing.
In some instances information meetings were held; the managers of the different enterprises were invited to an evening meeting. After a short introduction by the programme supervisor concerning the objective and the structure of the programme two students gave an account of the work they are doing. Subsequent discussions offer an opportunity to make the managers better acquainted with the project in particular and the possibilities of improving the working of the enterprise in general.

Evaluation

35. In cases where the study culminated in the actual implementation of the suggested improvements, the success of these improvements could be measured at the end of the study.
However, frequently it was found that introduction of the suggestions was not feasible within the allotted period. Then the final report was evaluated by both the management and an experienced outsider, for instance a professor in industrial management.
36. While management would of course concentrate on the feasibility of the proposals, the outsider would try to measure in how far the student had understood what he had done and how far the study had added to his insight into management problems.

EXPERIENCES IN THE NETHERLANDS

Other projects

37. After the projects for students of the Technological University proved a complete success, similar schemes were introduced for other groups of trainees.
38. These projects had different training objectives and therefore the structure of the programmes differed as well as the assignments in industry. Common to all projects was a period of classroom work followed by a practical in-plant study.
39. The students from Technical Colleges (Bachelor's Degree) followed a

programme identical to that of the University students (Master's Degree). The assignments in the former case were on the average more limited, due to differences in background of the students.

40. A programme for management assistants in small enterprises was set up as a contribution towards succession problems; in many small firms a young man is earmarked for future succession and has to work in the firm to get the necessary experience. During these formative years he could profitably act as an all-round assistant to the manager. The programme was designed to supply him with the necessary training for this function, and consisted of an applied course followed by supervised assignment in his own firm.

41. For young staff specialists the programme was designed to shorten the breaking-in period. Also here the supervised assignment was carried out in the student's firm. Participants were mostly young graduate engineers and economists.

42. It was found that students in engineering and economics in the last year before attaining their Master Degree could very well co-operate in research projects. In this case the students acted as research assistants gathering data in industrial firms. The student could do some scientific work and at the same time get some in-plant experience.

43. The in-plant training of international graduates is carried out within the framework of the "Six months International Course on Small-scale Industries", organized by the RVB. This course comprises a 3 months programme of classroom work, including lectures, exercises and case-studies, followed by a 10 weeks period of supervised in-plant work. The objective of this course is to acquaint persons from industrial development organizations in newly developing countries with the problems of small industry and to highlight measures for the promotion of a sound small industry. The theoretical programme of three months has therefore a wider task than the applied course of the student projects. The necessary recording techniques are only a part of this theoretical programme. The in-plant assignment has also a different character. In some cases a study resulting in suggestions for improvement is not possible and the assignment is therefore more descriptive. The student learns to describe an actual industrial enterprise. Often this description forms the basis for a scheme for the setting up of a similar enterprise in the home-country of the participant.

Task of the supervisor of an in-plant training project

44. In carrying out such a project it was found that the supervisor is the most important factor for a successful execution of the work. Although he will probably also play a role during the theoretical part of the course he has the task to co-ordinate the several objectives of the assignment:

. training: the assignment must be in accordance with the training needs of the participant (depending on his educational level) and must have his special interest (for instance a certain branch of industry). This objective can of course be reached more easily if a strict selection of the participants is possible;

. examination of plant problems: the supervisor must see to it that a suitable problem is chosen so that in the limited time available results can be obtained, of interest both to the student and the enterprise.

45. The above implies experience of and insight into the practice of consultancy work as well as into training aspects.

46. Furthermore the supervisor's personality must enable him to have pleasant contacts with the management and the student.

47. In order to achieve a reasonable time utilization the supervisor will have to coach about 4 - 9 students at the same time, depending on his other duties within the scope of the project.

48. Due to the project set-up all students will start their in-plant pro-

gramme at the same time. A great deal will depend on his ability to work independently and to plan his work adequately.

49. The supervisor should preferably not be under 30 years of age and have an academic degree and industrial experience to ensure his authority. It is furthermore advisable that he gives some lectures or leads some class discussions in the preparatory course to familiarize himself with the students. If possible he should participate once in a student project himself.

50. The RVB organized special supervisor-courses in which the supervisor was trained in the set-up of a project and the determination of assignments in industry.

PRE-REQUISITES FOR SIMILAR TRAINING IN LESS DEVELOPED AREAS

51. From the foregoing it can be gathered that there are certain pre-requisites for the successful execution of such projects. Some of them are evident, such as the availability of suitable industries, students and supervisors.

52. However, in projects carried out in the Netherlands the institutional framework proved to be of great importance. For instance the projects for Master and Bachelor Degree students were conducted in co-operation with the Ministry of Education and the Ministry of Economic Affairs; these authorities subsidized the work so that the industries had only to pay a nominal fee.

53. It is recommended to charge a small fee to the industries as they will in general not think highly of advice given for nothing and will therefore not be prepared to give their full co-operation.

54. In many developing countries in-plant training projects could conceivably be organized by an extension institute for small industry in co-operation with a University or College.

55. The assistance of manufacturers associations, federations of industries, chambers of commerce and similar bodies is of course very important. Labour unions should be given information concerning nature and objectives of the project and the value of efficiency improvement in general.

56. Of paramount importance of course is the man who will build up an organization for the execution of such projects.

57. For each particular project a scheme will have to be drawn up including inter alia:

- objectives
- size of the project
- cost of project and sources of funds
- number of years the project is to be run
- organization
- time schedule
- personnel requirements

58. In general it will not be practical to establish an organization for just one project and there will have to be designed an institute with a much wider range of activities in which the individual projects can be fitted in.

59. Such an institute might conceivably promote efficiency in other ways, for instance by consultancy and advisory services to enterprises, by creating documentation services and by the dissemination of information, by establishing research laboratories for development and demonstration of new working methods etc.

60. It is evident from the foregoing that all these activities and more especially the student training in industry will depend on getting industry itself interested in such projects.

609 E - Oct.1962 - 1,600